

Complete Summary

GUIDELINE TITLE

Practice advisory for intraoperative awareness and brain function monitoring. A report by the American Society of Anesthesiologists Task Force on Intraoperative Awareness.

BIBLIOGRAPHIC SOURCE(S)

American Society of Anesthesiologists Task Force on Intraoperative Awareness. Practice advisory for intraoperative awareness and brain function monitoring: a report by the American Society of Anesthesiologists Task Force on Intraoperative Awareness. *Anesthesiology* 2006 Apr; 104(4):847-64. [157 references] [PubMed](#)

GUIDELINE STATUS

This is the current release of the guideline.

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SCOPE

DISEASE/CONDITION(S)

Intraoperative awareness

GUIDELINE CATEGORY

Evaluation
 Management
 Prevention
 Risk Assessment

CLINICAL SPECIALTY

Anesthesiology

INTENDED USERS

Health Care Providers
Physicians

GUIDELINE OBJECTIVE(S)

- To identify risk factors that may be associated with intraoperative awareness
- To provide decision tools that may enable the clinician to reduce the frequency of unintended intraoperative awareness
- To stimulate the pursuit and evaluation of strategies that may prevent or reduce the frequency of intraoperative awareness
- To provide guidance for the intraoperative use of brain function monitors as they relate to intraoperative awareness

TARGET POPULATION

Adult patients undergoing a procedure during which general anesthesia is administered

Note: This Advisory is not intended for the perioperative management of minimal, moderate, or deep sedation in the operating room or intensive care unit; regional or local anesthesia without general anesthesia; monitored anesthesia care; tracheal intubation of patients or those undergoing resuscitation in emergency trauma after the administration of a neuromuscular block, or intentional intraoperative wake-up testing (e.g., for the purposes of assessing intraoperative neurologic function). In addition, this Advisory is not intended to address the perioperative treatment of pediatric patients.

INTERVENTIONS AND PRACTICES CONSIDERED

1. Preoperative evaluation
 - Review of patient's medical records for potential risk factors such as previous episode of intraoperative awareness, substance use or abuse, history of difficult intubation, etc.
 - Patient interview to assess level of anxiety
 - Physical examination
 - Other potential risk factors such as cardiac surgery, Cesarean delivery, trauma surgery, etc.
 - Informing patients considered to be at substantially increased risk of the possibility of intraoperative awareness
2. Preinduction phase of anesthesia
 - Adherence to a checklist protocol for anesthesia machines and equipment
 - Verifying proper functioning of intravenous access and infusion pumps
 - Prophylactic benzodiazepine administration in selected patients
3. Intraoperative monitoring using multiple modalities including
 - Clinical techniques (e.g., checking for purposeful or reflex movement)

- Conventional monitoring systems (e.g., electrocardiogram, blood pressure, heart rate)
 - Brain function monitoring in selected patients
4. Intraoperative and postoperative management
- Intraoperative benzodiazepine or scopolamine administration on a case-by-case basis
 - Using a questionnaire or structured interview to obtain a detailed account of patient's experience
 - Counseling or psychological support for patients who report an episode of intraoperative awareness

MAJOR OUTCOMES CONSIDERED

- Occurrence or frequency of intraoperative awareness
- Emergence time
- Consumption of anesthetic drugs
- Recovery characteristics

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
 Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

For this Advisory, a literature review was used in combination with opinions obtained from experts and other sources (e.g., professional society members, open forums, Web-based postings) to provide guidance to practitioners regarding intraoperative awareness. Both the literature review and opinion data were based on evidence linkages, consisting of directional statements about relationships between specific perioperative interventions and intraoperative awareness. The evidence linkage interventions are listed in Appendix 2 of the original guideline document.

A study or report that appears in the published literature is included in the development of an advisory if the study (1) is related to one of the specified linkage statements, (2) reports a finding or set of findings that can be tallied or measured (e.g., articles that contain only opinion are not included), and (3) is the product of an original investigation or report (i.e., review articles or follow-up studies that summarize previous findings are not included).

For the literature review, potentially relevant studies were identified via electronic and manual searches of the literature. The electronic search covered a 40-year period from 1966 through 2005. The manual search covered a 36-year period of time from 1970 through 2005. More than 1,500 citations were initially identified, yielding a total of 711 nonoverlapping articles that addressed topics related to the evidence linkages and met our criteria for inclusion. After review of the articles, 389 studies did not provide direct evidence and were subsequently eliminated. A total of 322 articles contained direct linkage related evidence. No evidence linkage

contained enough studies with well-defined experimental designs and statistical information to conduct a quantitative analysis (i.e., meta-analysis).

NUMBER OF SOURCE DOCUMENTS

A total of 322 articles contained direct linkage related evidence.

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Expert Consensus

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Literature Review

Interobserver agreement among Task Force members and two methodologists was established by interrater reliability testing. Agreement levels using a kappa statistic for two-rater agreement pairs were as follows: (1) type of study design, kappa = 0.60 to 0.85; (2) type of analysis, kappa = 0.60 to 0.93; (3) evidence linkage assignment, kappa = 0.77 to 0.88; and (4) literature inclusion for database, kappa = 0.76 to 1.00. Three-rater chance-corrected agreement values were (1) study design, Sav = 0.82, Var (Sav) = 0.007; (2) type of analysis, Sav = 0.73, Var (Sav) = 0.008; (3) linkage assignment, Sav = 0.69, Var (Sav) = 0.012; and (4) literature database inclusion, Sav = 0.84, Var (Sav) = 0.014. These values represent moderate to high levels of agreement.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

The American Society of Anesthesiologists (ASA) appointed a Task Force of 10 members to: (1) review and assess currently available scientific literature on intraoperative awareness, (2) obtain expert consensus and public opinion, and (3) develop a practice advisory. The Task Force is comprised of anesthesiologists from various geographic areas of the United States, an anesthesiologist from The Netherlands, and two methodologists from the ASA Committee on Practice Parameters.

The Task Force used a six-step process. First, the members reached consensus on the criteria for evidence of effective perioperative interventions for the prevention of intraoperative awareness. Second, they evaluated original articles published in peer-reviewed journals relevant to this issue. Third, consultants who had expertise or interest in intraoperative awareness and who practiced or worked in diverse settings (e.g., scientists and/or physicians in academic and private practice) were asked to participate in opinion surveys on the effectiveness of various perioperative management strategies and to review and comment on a draft of the Advisory developed by the Task Force. Fourth, additional opinions were solicited from a random sample of active members of the ASA. Fifth, the Task Force held open forums at three national and international anesthesia meetings to solicit input on the key concepts of this Advisory. Sixth, all available information was used to build consensus within the Task Force on the Advisory.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

Guideline developers reviewed published cost analyses.

METHOD OF GUIDELINE VALIDATION

External Peer Review
Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

The draft document was made available for review on the American Society of Anesthesiology (ASA) Web site, and commentary was invited via e-mail announcement to all ASA members. All submitted comments were considered by the Task Force in preparing the final draft.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

A summary of the Practice Advisory is presented below.

Preoperative Evaluation

- Review patient medical records for potential risk factors
 - Substance use or abuse
 - Previous episode of intraoperative awareness
 - History of difficult intubation or anticipated difficult intubation
 - Chronic pain patients using high doses of opioids
 - American Society of Anesthesiologists (ASA) physical status IV or V
 - Limited hemodynamic reserve
- Interview patient

- Assess level of anxiety
 - Obtain information regarding previous experiences with anesthesia
- Determine other potential risk factors
 - Cardiac surgery
 - Cesarean delivery
 - Trauma surgery
 - Emergency surgery
 - Reduced anesthetic doses in the presence of paralysis
 - Planned use of muscle relaxants during the maintenance phase of general anesthesia
 - Planned use of nitrous oxide-opioid anesthesia
- Patients whom the individual clinician considers to be at substantially increased risk of intraoperative awareness should be informed of the possibility of intraoperative awareness when circumstances permit

Preinduction Phase of Anesthesia

- Adhere to a checklist protocol for anesthesia machines and equipment to assure that the desired anesthetic drugs and doses will be delivered
- Verify the proper functioning of intravenous access, infusion pumps, and their connections, including the presence of appropriate back-flow check valves
- The decision to administer a benzodiazepine prophylactically should be made on a case-by-case basis for selected patients (e.g., patients requiring smaller dosages of anesthetics)

Intraoperative Monitoring

- Use multiple modalities to monitor depth of anesthesia
 - Clinical techniques (i.e., checking for purposeful or reflex movement)
 - Neuromuscular blocking drugs may mask purposeful or reflex movement
 - Conventional monitoring systems (e.g., electrocardiogram, blood pressure, heart rate, end-tidal anesthetic analyzer, capnography)
 - Brain function monitoring
 - Not routinely indicated for general anesthesia patients
 - The decision to use a brain function monitor should be made on a case-by-case basis by the individual practitioner for selected patients (e.g., light anesthesia)

Intraoperative and Postoperative Management

- The decision to administer a benzodiazepine intraoperatively after a patient unexpectedly becomes conscious should be made on a case-by-case basis
- Speak with patients who report recall of intraoperative events to obtain details of the event and to discuss possible reasons for its occurrence
- A questionnaire or structured interview may be used to obtain a detailed account of the patient's experience
- Once an episode of intraoperative awareness has been reported, an occurrence report regarding the event should be completed for the purpose of quality management
- Offer counseling or psychological support to those patients who report an episode of intraoperative awareness

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of evidence supporting the recommendations is not specifically stated.

The advisory statements contained in this document represent a distillation of the current spectrum of clinical opinion and literature-based findings.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

- Reduced frequency of unintended intraoperative awareness
- Appropriate use of brain function monitors

POTENTIAL HARMS

The use of scopolamine may result in unintended side effects (e.g., emergence delirium).

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

- Practice advisories are systematically developed reports that are intended to assist decision-making in areas of patient care. Advisories provide a synthesis and analysis of expert opinion, clinical feasibility data, open forum commentary, and consensus surveys. Advisories are not intended as standards, guidelines, or absolute requirements. They may be adopted, modified, or rejected according to clinical needs and constraints.
- The use of practice advisories cannot guarantee any specific outcome. Practice advisories summarize the state of the literature and report opinions derived from a synthesis of task force members, expert consultants, open forums, and public commentary. Practice advisories are not supported by scientific literature to the same degree as standards or guidelines because of the lack of sufficient numbers of adequately controlled studies. Practice advisories are subject to periodic revision as warranted by the evolution of medical knowledge, technology, and practice.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Staying Healthy

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

American Society of Anesthesiologists Task Force on Intraoperative Awareness. Practice advisory for intraoperative awareness and brain function monitoring: a report by the American Society of Anesthesiologists Task Force on Intraoperative Awareness. *Anesthesiology* 2006 Apr; 104(4):847-64. [157 references] [PubMed](#)

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2006 Apr

GUIDELINE DEVELOPER(S)

American Society of Anesthesiologists - Medical Specialty Society

SOURCE(S) OF FUNDING

American Society of Anesthesiologists

GUIDELINE COMMITTEE

Task Force on Intraoperative Awareness

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Task Force Members: Jeffrey L. Apfelbaum, M.D. (Chair), Chicago, Illinois; James F. Arens, M.D., Houston, Texas; Daniel J. Cole, M.D., Phoenix, Arizona; Richard T. Connis, Ph.D., Woodinville, Washington; Karen B. Domino, M.D., Seattle, Washington; John C. Drummond, M.D., San Diego, California; Cor J. Kalkman, M.D., Ph.D., Utrecht, The Netherlands; Ronald D. Miller, M.D., San Francisco, California; David G. Nickinovich, Ph.D., Bellevue, Washington; Michael M. Todd, M.D., Iowa City, Iowa

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Two of the 10 members of the Task Force disclosed receipt of funds from or a financial interest in a company developing or manufacturing brain function monitors; these companies have a direct financial interest in the expanded use of such monitors. Task Force members may also have received funds from or have a financial interest in other companies, such as developers or manufacturers of anesthetics that may be indirectly affected by the expanded use of brain function monitors. The Task Force did not request for its members to disclose such interests because they were deemed too remote and speculative to present conflicts of interest.

Fifty-four percent of the consultants disclosed receipt of funds from or a financial interest in a company developing or manufacturing brain function monitors. Consultants also may have received funds from or have a financial interest in other companies that may be indirectly affected by the use of brain function monitors. The Task Force did not request for its consultants to disclose such interests because they were deemed too remote and speculative to present conflicts of interest.

GUIDELINE STATUS

This is the current release of the guideline.

GUIDELINE AVAILABILITY

Electronic copies: Available from the [Anesthesiology Journal Web site](#).

Print copies: Available from the American Society for Anesthesiologists, 520 North Northwest Highway, Park Ridge, IL 60068-2573.

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI on May 19, 2006. The information was verified by the guideline developer on May 24, 2006.

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